



**United States
Department of
Agriculture**

Agricultural
Marketing
Service

Fruit and
Vegetable
Programs

Processed
Products
Branch

Grading Manual for Frozen Ripe Tart Pitted Cherries

Effective June 1977

GENERAL INFORMATION

The largest growing area for red tart cherries is the Great Lakes region with Michigan leading all states. Other growing areas are: Washington, Oregon, California, Utah, Colorado, New York, and Wisconsin. Montmorency is the leading variety grown for processing.

Cherries are ready to harvest when the fruit is red and the stem detaches easily from the pit. Mechanical harvesting (shaking) has replaced hand picking. Harvesters shake the fruit from the tree onto a fabric apron. Mechanically harvested cherries contain immature fruit mixed with fully-ripened fruit. The sugar content of immature cherries is low. Since sugar retards oxidation, the poor color and character of immature cherries is noticeable in the finished product. After cherries are removed from the tree they are placed in cold water to prevent scalding (discoloration). Cherries are delivered to the processing plant in water. For this reason, cherries are bought by volume.

Mechanically harvested cherries contain many attached stems. A stemming operation is necessary. Stems are classified as harmless extraneous material if they are included in the frozen cherries. Incoming cherries receive some type of inspection prior to processing. The processor usually rejects cherries with maggot infestation.

Cherries are held in large soak tanks of cold water to firm the fruit prior to pitting and processing. Improperly firmed fruit is easily "pitter torn." Cherries are flumed from the soaking tank to a sorting belt. Sorting personnel remove the most obvious defects, such as damaged fruit, loose pits, stems, and foliage. Electric-eye sorting equipment is used to reject defective cherries. However, the same machine cannot reject both dark and light colored individual cherries at a given setting. Cherries usually go directly to the final container after pitting and sorting. Bulk containers comprise the volume of the frozen cherry pack with 30-pound cans and polyethylene-lined steel drums used for this purpose.

Cherries are normally covered with sugar and/or sirup to provide a barrier to inhibit oxidation. Cans and drums are covered and moved into cold storage. Quick freezing is desirable to prevent deterioration. In some processing plants, the cold storage facility is too small to hold all of the filled containers at the peak of the season. Excess containers are often trucked considerable distance to reach commercial cold storage facilities. Cherries are also packed IQF (Individually Quick Frozen). This process freezes the fruit quickly and it is packed "free-flowing" without a packing medium. IQF cherries are bright in color but discolor quickly after thawing.

SAMPLING

Use suitable equipment to sample frozen cherries. First, wear protective clothing inside the cold storage. Next, select the number of containers for the sample and move them to a safe, warm working area. Use a special cover remover for 30-pound cans and a hammer, wrench, and bar to uncover steel drums. A hammer, steel chisel, and small scoop are useful to loosen frozen cherries and remove them from the container. Place each sample unit in a polyethylene bag or other clean, suitable container. Place the Poly bag in an insulated chest. Use dry ice in the chest if the sample units are transported considerable distance. This is especially important with IQF cherries because partial thawing may oxidize the cherries and affect the final grade. When only a portion of the contents are removed from any large container, carefully select the sample unit to be representative. A sample unit scraped from the entire top layer of a large container is worthless.

SAMPLE UNIT

A sample unit is as follows:

1. The entire contents of a container; or
2. A portion of the contents of a container; or
3. A combination of the contents of two or more containers; or
4. A portion of unpacked product.

Each sample unit must contain 100 cherries and weigh at least 20 ounces. Sample enough cherries to satisfy each requirement.

CONDITION OF THE PRODUCT

Record the general appearance of the product and container. Note any abnormal condition on the certificate of sampling. Some of the conditions found in frozen cherries are as follows:

1. Excessive ice in the container; or
2. Severe oxidation of the top layer of cherries which indicates possible thawing or refreezing or slow initial freezing; or
3. "Slack-filled" containers; or

CONDITION OF THE PRODUCT (CONTINUATION)

4. Off-odors
5. Condition of the container, such as staining, leakage, serious denting, double-seam damage, loose can or drum covers, and torn or damaged polyethylene liners; or
6. Flakes of paint or other foreign material on top of the cherries or "sugar cap" of large containers; or
7. Used containers.

Except for IQF cherries, "coning" or "mounding" is expected in properly frozen cherries packed in large containers. Absence of this condition indicates improper freezing. Occasionally, buyers request that the "sugar cap" of large drums not be disturbed by sampling. Inspection is accomplished only by sample units drawn from the processing line. Follow Branch instructions for certification of line-check sample units. Also, some buyers request that containers opened for sampling be identified by some official mark.

SPECIAL PROCEDURES

Net weight determination of large containers is usually omitted under lot inspection unless specifically requested by the applicant. Net weight is recorded as part of the fruit to sugar ratio determination under in-plant inspection. The ratio of fruit to sugar is not certified unless these detailed records are maintained during packing operations. Drained weight determination is not ordinarily made on frozen cherries. It is time consuming. Thawing is extremely critical for IQF cherries. Don't thaw more sample units than can possibly be graded in a reasonable period of time.

ORDER OF SCORING QUALITY FACTORS IN A SAMPLE UNIT

Adjust the sample unit to 20-ounces of drained cherries. Score the quality factors as follows:

1. Select 100 cherries from the 20-ounces;
 - a. Score color;
 - b. Determine size;
 - c. Score defects (other than HEM);
2. Use the entire 20-ounces;
 - a. Score character;
 - b. Determine HEM;
 - c. Determine flavor; and
 - d. Score pits.

COLOR

The typical color of fresh RTP cherries is different from the color of frozen cherries. The color of frozen cherries is similar to fresh cherries. Each individual cherry retains its color characteristics. Score color immediately after thawing when the cherries are easily separated and the surface is free of ice and sugar. Do not go back and correct color scores after the sample units have been setting on the grading table. Proper sampling techniques are required to produce representative color score. Sample units drawn from the top layer of large containers are not representative and seriously downgrade the product.

Oxidation of the top layer of cherries in large containers.

Discoloration due to oxidation occurs on the top layer of cherries packed in large containers. Consider discoloration insignificant when it is slight and affects only the extreme top layer. If discoloration is severe, or the depth is sufficient to affect a large number of cherries, consider the top layer of oxidation in the overall color score. Use the following method to determine the color score:

1. Measure the depth of fruit which is 100 percent oxidized. Divide this figure by the depth of fruit in the container. The result is the percentage of fruit in the entire container that is affected by scoreable oxidation;

COLOR (CONTINUATION)

Oxidation of the top layer (continuation)

2. By count, based on a sample unit taken from below the layer of scoreable oxidation, calculate the percentage of cherries in the remainder of the container that is scoreable against color. Multiply this percentage by the percentage of cherries in the container under the layer of oxidation (obtain by subtracting the percentage obtained in "1" (above) from 100 percent); and
3. The sum of the two percentages in "1" and "2" (above) is the percentage of the cherries in the entire container which is scoreable as varying markedly from the typical color.

Example.

If the depth of cherries in the container is 15 inches and the depth of cherries 100 percent oxidized is 3 inches, the percentage of oxidized cherries of the entire container is $(3 \div 15 \times 100)$ -----20% of total.

If the cherries in the sample unit (below the oxidized top layer) scoreable against color is 3 percent, then 3 percent of the remaining 80 percent $(80 \times .03)$ -----
-- 2.4% of total.

The sum of the percentages obtained in "1" and "2" (above) is $(20 + 2.4)$ -----
----- 22.4% of total.

Color requirements.

Cherries that are properly ripened for freezing will range in color from bright cherry-red to dark-red. The fruit retains these characteristics when quickly frozen and kept frozen. The following cherries fail color requirements:

1. Cherries that have a distinct yellow-brown cast that is characteristic of oxidation due to scale. These are usually the least red cherries;
2. Cherries that are dull due to bruising and oxidation; and
3. Undercolored cherries. Score all cherries that are less red than the USDA Color Guides "undercolored." It's not possible to exactly match the color of the cherry with the color of the guide.

COLOR (CONTINUATION)

Assigning score points for color.

<u>Score points</u>	<u>Number of cherries that fail color</u>	<u>overall color</u>
30	1, 2, 3	
29	4, 5, 6	Bright
28	7, 8, 9	and
27	10, 11, 12	practically uniform
26	13, 14	Reasonably bright
25	15, 16	and
24	17, 18	reasonably uniform
23	19, 20, 21	Fairly bright
22	22, 23	and
21	24, 25	fairly uniform
20 or less	26 or more	"Off-color"

CHARACTER

Consider firmness and meatiness of flesh, toughness, and rubberyness in evaluation of character.

Character requirements.

Grade A. Score character grade A when the fruit is thick-fleshed and well-ripened.

Grade B. Score character grade B when the fruit is lacking in fleshiness but not thin-fleshed;

Grade C. Score character grade C when the fruit is (1) collapsed; (2) soft; (3) flabby; (4) thin-fleshed; or slightly tough.

Substandard. Score @ character Substandard when the fruit is (1) mushy; (2) leathery; (3) totally immature; or (4) objectionable.

SIZE

Small cherries are removed with a size grading device. Normal cherries are large in size. Small cherries are uncommon unless the growing season has been affected by bad weather. Size is a prerequisite to all grades above grade C. Determine size only on "suspect" cherries. "plump-out" the pitted cherry to its approximate original shape. Measure the diameter at right angles to the pitter axis. Do not force cherries through the circular openings in the measuring plate. Determine whether the "plumped-out" cherry does or does not fill the opening in the plate. Don't count questionable cherries.

Sample units that fail size requirements for grade A, but are acceptable for grade B, are considered with other quality deviants and allowed in a grade A sample in accordance with the "Regulations."

Sample units that fail size requirements for grade B are considered with other quality deviants and allowed in a grade B sample in accordance with the "Regulations." Sample units that fail size requirements for grade B are worse-than-a-deviant in a grade A sample.

DEFECTS

The factor of defects in an evaluation of the cherries' growing season, harvest and preparation for processing (workmanship). Bad weather during the growing and ripening season, abuse during the harvest, and poor processing affect the amount of defective fruit. The U. S. standards allow a specified number of defects in each grade classification. The standards do not include an overall sample unit appearance requirement with respect to defects. A defect is either scorable against the allowance provided in Table I of the U. S. standards or it is not considered. Do not downgrade the sample unit because of numerous insignificant defects.

Minor blemished cherry.

A skin blemish, 9/32-inch or less in diameter, is either scorable or insignificant. Score the blemish if it "more than slightly" affects the appearance of the cherry. Consider small, light-colored skin blemishes insignificant.

Aggregate area.

The U. S. standards include "aggregate area" in both "minor blemished cherry" and "blemished cherry". Interpret "aggregate area" as all of the blemished areas on each individual cherry and their relationship to the area of a circle 9/32-inch in diameter.

DEFECTS (CONTINUATION)

Scald.

Don't score "scald" as a defect. Score it under the factor of color.

Mutilated cherry.

Don't count a cherry that is pitter-torn and held together as one unit by a thin piece of flesh or skin. Score only cherries with the entire Pit cavity exposed.

Foreign material.

Cherries are susceptible to damage from insects and decay. Visible decay is ordinarily removed during sorting. Maggots are much more difficult to find and it is extremely difficult to remove them. Examine frozen cherries for maggot infestation and Presence of decay. Consider these two types of defects twice. First, as blemished cherries. Second, as unavoidable defects in processed cherries (File Code 172).

Harmless extraneous material.

This requirement is limited to the 20-ounce sample unit. Do not intentionally pick HEM from a large container and include it in the sample unit. Evaluate compliance with the allowance for HEM on the basis of all the HEM in the sample unit. Evaluate all of the sample units in the sample for HEM and total the weight (cumulative) of all of the sample units. Divide the number of pieces of HEM (total Pieces in the entire sample) into the cumulative weight of all of the sample units in the sample. This figure represents the average HEM found in the sample. Apply it to the allowance in Table I of the U. S. standards.

Example.

3 pieces of HEM in 6 sample units.

$$\frac{6 \times 20 \text{ oz.}}{3 \text{ pieces}} = \frac{120}{3} = 1 \text{ piece of HEM per 40 ounces.}$$

DEFECTS (CONTINUATION)

Harmless extraneous material (continuation).

Assigning score points for HEM.

1. Sample units free of HEM. Assign the score point value to each sample unit which does not contain HEM based on all defects other than HEM, Do not adjust this score point value regardless of the HEM average for the total sample.
2. Sample units which contain HEM. leave the defect score blank on each sample unit which contains HEM until the sample is averaged. Then assign 17 points if HEM fails the requirements of grade A or 15 points if it fails grade B. If the overall meets grade A give 18 points or bottom grade A.
3. Grade of a lot. The relationship of total HEM vs total sample, not the number of deviants, determines the grade of the lot, unless downgraded by other factors.

Ascertaining score points for defect other than HEM.

Total Defects (Mutilated, minor blemished and blemished)	Blemished	Score Points
0-1-2-3	1	20
4-5-6-7	2	19
8-9-10	3	18
11-12-13	4-5	17
14-15	6-7	16
16-17-18	8-9-10-11	15
19-20	12-13-14-15	14
21 or less	16 or more	13 or less

FLAVOR

Normal flavor is a prerequisite to all grades above Substandard. Grade "off-flavor," but edible, sample units Substandard. Include deviants to normal flavor and odor with other quality deviants. Consider inedible sample units as "worse-than-a-deviant."

PIT MATERIAL

The pit material allowance is based on a 20-ounce sample unit. Evaluate compliance with the pit material allowance on the basis of all of the 20-ounce sample units in the sample. Do not score individual sample units that contain the pits lower than sample units that contain zero pits.

Procedure for detecting pit material.

Examine each sample unit for Pit material. Use the following procedure:

1. Arrange cherries in a single layer on the grading tray;
2. Press each cherry with finger tips, or suitable device to detect all pit material;
3. Repeat "1" and "2" (above) until all pit material is found; and
4. Record the pit material on the score sheet.

Pitting deviants.

Sample units that contain not more than 2 pits are allowed in grade A. Not more than 3 pits are allowed in grade B. And any number are in grade C. The sample average must meet the allowance for the specific grade classification.

Sample units that fail the allowance for grade A, but are acceptable for grade B, are considered with other quality deviants and allowed in a grade A sample in accordance with the "Regulations."

Sample units that fail the individual allowances for grade B are considered with other quality deviants and allowed in a grade B sample in accordance with the "Regulations."

Any number of pits are allowed in a grade C sample unit. A grade C sample unit is "worse-than-a-deviant" in a grade A sample and is allowed per Branch instructions.

PIT MATERIAL (CONTINUATION)

Assigning score points for pits.

Examine all of the sample units for pit material. Determine the score point value for the sample and assign the same score point value to each sample unit (assign the same score to pitting deviants as other sample units). Assign score points for pit material as follows:

<u>Score Points</u>	<u>Maximum number of pits in the total sample</u>
20	1 per 120 oz. or over
19	1 per 80 oz.
18	1 per 40 oz.
17	1 per 35 oz.
16	1 per 30 oz.
15	1 per 25 oz.
14	1 per 20 oz.
13 or less	1 per 19 oz. or less

Use the scoring guide as follows:

1. Determine the number of pits in the total sample and find this point on the vertical axis;
2. Determine the number of 20-ounce sample units in the total sample and find this point on the horizontal axis: and
3. Assign the score point where lines from the points on the two axes intersect. Give a borderline sample the highest score point."

Example.

<u>Pits</u>	<u>Number of sample units</u>	<u>Score points</u>
5	38	20
1	3	18
11	21	17